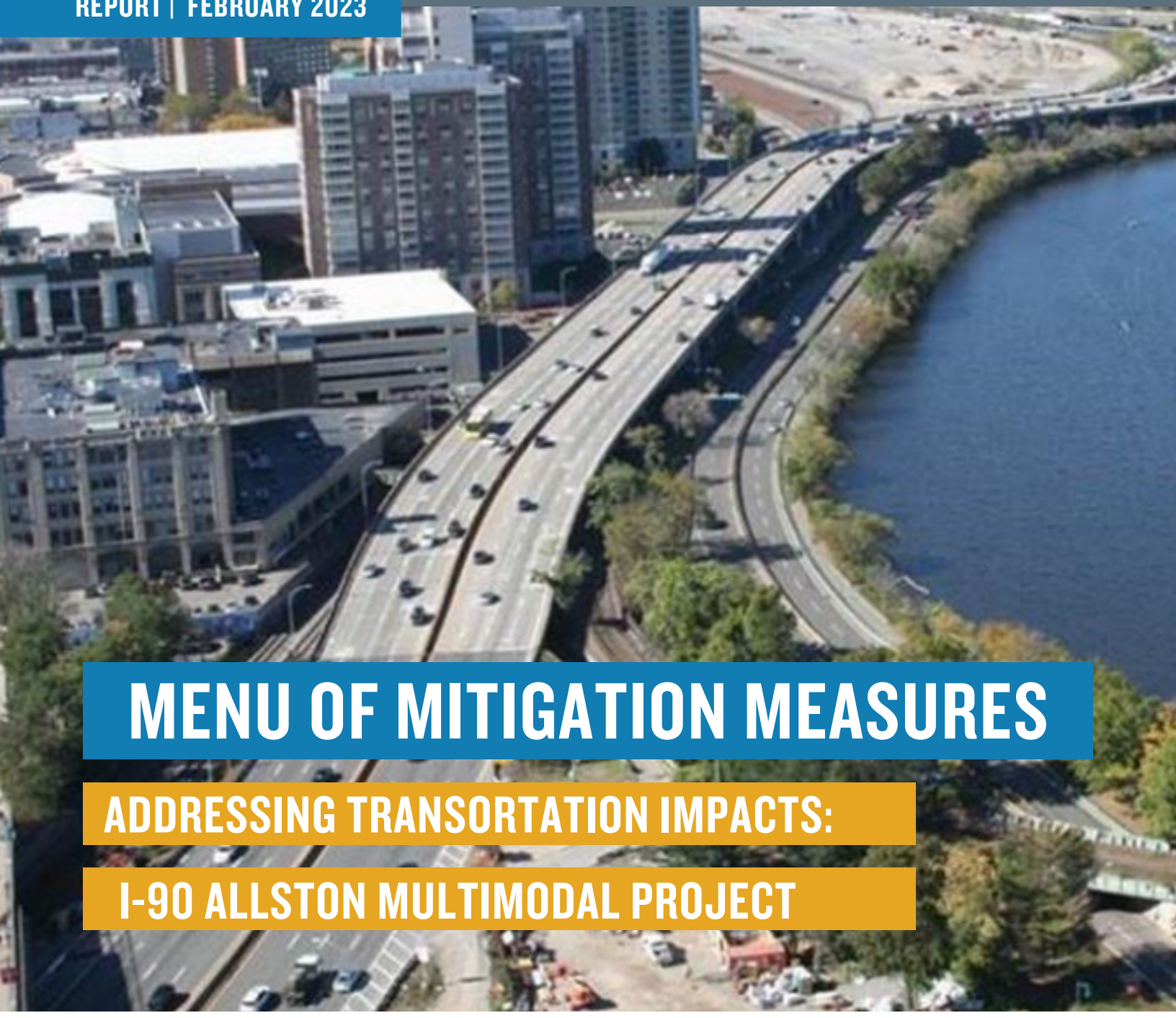
A BETTER CITY

REPORT | FEBRUARY 2023



MENU OF MITIGATION MEASURES

ADDRESSING TRANSORTATION IMPACTS:

I-90 ALLSTON MULTIMODAL PROJECT

REPORT TEAM

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Barr Foundation

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KEY ASSUMPTIONS

This report uses pre-pandemic assumptions and data as the basis for underlying calculations. The geographic focus of the analysis extends both within and outside of Route 128. The report assumes the MassDOT Phase I Viaduct Preservation Contract is not yet awarded and that the recommendations herein are implemented and completed before construction begins on the I-90 Allston Multimodal Project. Further, the sections on Rail Transformation and Framingham/Worcester Line upgrades rely on the MBTA approach presented on April 12, 2021, with the caveat that the Framingham/Worcester Line is incorporated into Phase I of Regional Rail implementation and completed to mitigate any I-90 Allston Multimodal Project related traffic disruption.

A BETTER CITY

A Better City represents a multi-sector group of nearly 130 business leaders united around a common goal: to enhance the Greater Boston region's economic health, competitiveness, equitable growth, sustainability, and quality of life for all communities. By amplifying the voice of the business community through collaboration and consensus-building, A Better City develops solutions and influences policy in three critical areas: 1. transportation and infrastructure, 2. land use and development, and 3. energy and the environment. A Better City is committed to building an equitable and inclusive future for the region that benefits and uplifts residents, workers, and businesses in Greater Boston.

Commentary

On February 22, 2023, A Better City presented the report recommendations to member representatives and expert stakeholders. Participants offered their views and suggestions on the mitigation approach and measures. The following list captures the input provided. A Better City appreciates the constructive feedback and looks forward to investigating further.

- Mitigation requires action on multiple levels and benefits from taking a longer view that considers construction and environmental actions and serves as a platform for transformational measures such as housing and decarbonization goals.
- Local mitigation strategies are critical to reducing traffic disruption, including exits along I-90 that already impact vehicular flow including Exit 127 (former Exit 17).
- Construction sequencing extends beyond the project itself and should consider the timing and potential impacts of other work planned as well as coordination with appropriate agencies to avoid unintended yet deeper disruption.
    - Encourage coordination between Department of Conservation & Recreation (DCR) and MassDOT when considering scope and timing of any work on Soldiers Field Road, including narrowing lanes, that could impact I-90 traffic mitigation.
    - Promote coordination with Boston Transportation Department (BTD) related to adjacent Western Ave transitway impacts and timing.
- Consider alternative, local routes to reduce traffic on main roadways.
- Address MBTA workforce challenges and service planning issues to allow enhanced bus service during construction, including potential shuttle buses, when possible, to improve circulation and reduce single occupancy car use.
    - Enhance bus service along through the project zone including MBTA Bus Route #64 along Cambridge St and #70 along Western Ave.

EXECUTIVE SUMMARY

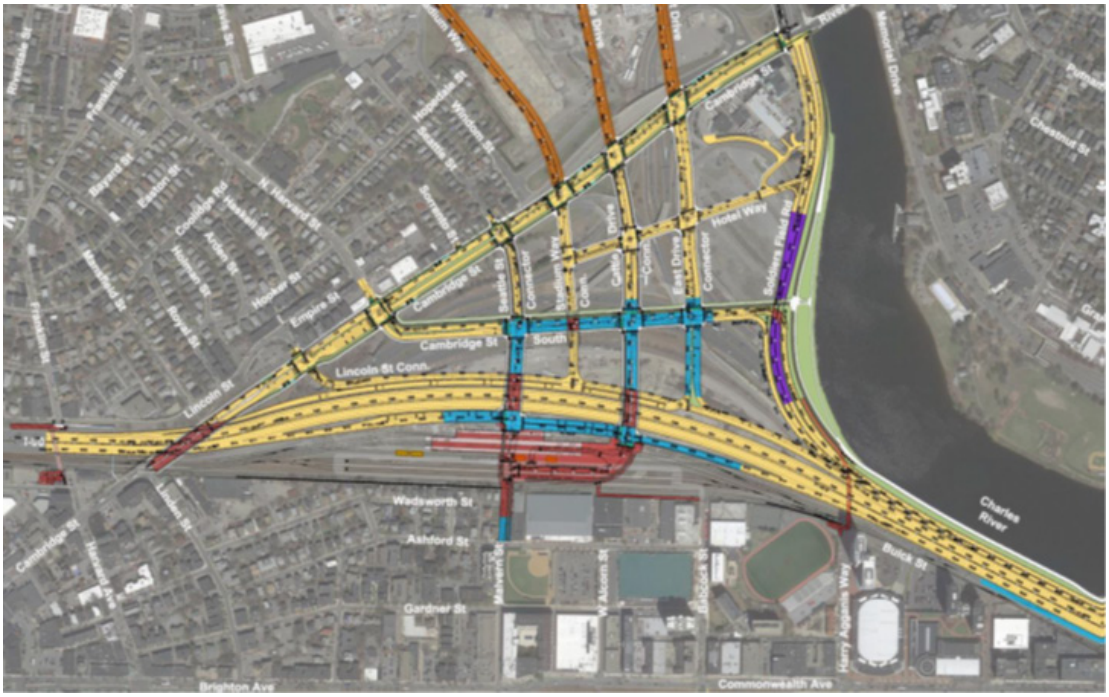
In May 2022, MassDOT and the City of Boston submitted a Multimodal Project Discretionary Grant Opportunity (MPDG) application seeking $1.2 billion of National Infrastructure Project Assistance (Mega) to support the $1.985 billion project.[1] The project proposes a complete redesign of the Allston I-90 Interchange. It will reconnect communities previously separated from one another, provide greater access to public transit and public spaces like the Charles River, as well as create active mobility options and cross-town pedestrian and bicycle connections via the "People's Pike." The project did not receive funding in the first-round of Mega grant awards and discussion is underway to determine next steps to improve the project's chances to win funds in future rounds.[2]

The Multimodal Project was planned to be procured and implemented using the Design/Build approach with procurement beginning in August 2024, Notice to Proceed in October 2025, and completion of construction targeted for 2032.[3] A new timeline will be proposed when the application is resubmitted for federal funding. Whenever the project is implemented, it will likely cause temporary but significant challenges to vehicular movement along portions of the 35-mile corridor extending from Worcester, MetroWest, Newton, and Allston an already congested gateway to Cambridge and Boston.[4] It is important to note that disruption would occur even if MassDOT had opted to forgo or delay this larger project and to simply repair the existing, antiquated elevated aqueduct.

Figure I: Locus of I-90 Allston Multimodal Project Area (existing conditions as at 2022)

Source: A Better City and AECOM (2022), Economic Benefits of the Allston Multimodal Project

Figure 2: Conceptual Plan for I-90 Allston Multimodal Project



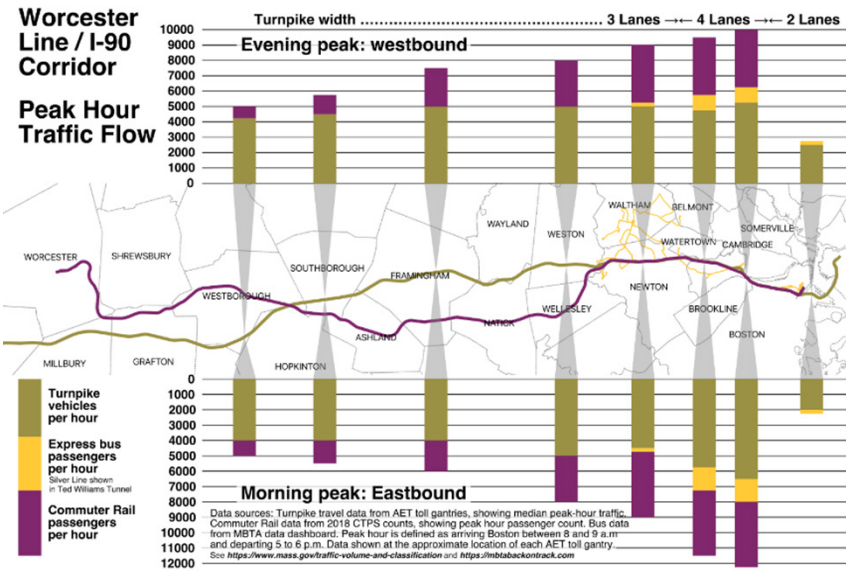
Source: A Better City and AECOM (2022), Economic Benefits of the Allston Multimodal Project

In April 2019, Massachusetts lawmakers requested the development of a detailed mitigation plan for the short-term and long-term traffic and economic impacts of the I-90 Allston Multimodal project.[5] In the MPDG application, MassDOT proposed to minimize traffic disruption by keeping three lanes open in each direction on I-90 from the vicinity of Boston Landing to the Commonwealth Avenue Bridge (approximately 2 miles) in both directions during morning and evening peak hours, as well two lanes open along Soldiers Field Road that connects commuters from I-90 to Cambridge and Boston at Exit 131 (Allston Interchange). [6]

At the same time, MassDOT noted in the application that it could not guarantee regular service on the Framingham/Worcester Line throughout the construction period—a condition that could impede the Commonwealth's ability to mitigate traffic disruption associated with the I-90 Allston Multimodal Project. The Framingham/Worcester Line serves communities along I-90 and is an integral part of the transportation corridor that connects the western suburbs to the inner core. This issue may be addressed in the next application for federal funding.

Pre-pandemic, the Framingham/Worcester Line was the system's second busiest line (after Providence-Stoughton) and had 9,353 daily week-day inbound boardings, 7,664 during the morning peak hours, with 98% of all riders boarding before Boston Landing and commuting to jobs at Lansdowne, Back Bay or South Station.[7] [8] There is no question that two-track service provides important capacity during the weekdays for the duration of the I-90 Allston Multimodal Project and is in the front line of mitigation measures with a direct impact on current and future users in the corridor.

Figure 3: Framingham/Worcester Line



Source: Ari Ofsevit based on 2018 Commuter Rail Counts and MassDOT I-90 travel data from AET toll gantries

The measures that MassDOT recommended will have some impact but may not be sufficient to prevent a strain on commuters and the local economy alike. Pre-pandemic, Boston ranked number one for congestion two years running in the INRIX Report (Table 1), with commuters losing 149 hours due to congestion—equivalent to six days. [9] This segment of I-90 alone served 147,000 vehicles each day. [10] Given these baseline conditions, mitigation to reduce traffic disruption and the resulting economic costs congestion incurs will therefore be important for the success of the I-90 Multimodal Project.

Table I: Boston Ranks #1 for Congestion in 2019

2019 CONGESTION RANK (2018)	URBAN AREA	HOURS LOST IN CONGESTION	2018-2019 CHANGE	2017-2018 CHANGE	INCIDENT IMPACT	COST PER DRIVER	TOTAL COST PER CITY	BIKE	TRANSIT	LAST MILE SPEED (MPH)
1 (1)	Boston, MA	149	-5%	3%		$2,205	$4.1B			12
2 (3)	Chicago, IL	145	4%	0%		$2,146	$7.6B			11
3 (5)	Philadelphia, PA	142	4%	5%		$2,102	$4.5B			10
4 (2)	New York City, NY	140	-4%	-3%		$2,072	$11B			11
5 (3)	Washington DC	124	-11%	4%		$1,835	$4.1B			10
6 (7)	Los Angeles, CA	103	4%	-8%		$1,524	$8.2B			16
7 (6)	San Francisco, CA	97	-8%	-4%		$1,436	$3B			10
8 (9)	Portland, OR	89	10%	-7%		$1,317	$1.2B			14
9 (11)	Baltimore, MD	84	5%	9%		$1,243	$1.3B			10
10 (12)	Atlanta, GA	82	9%	-3%		$1,214	$3.0B			12

Source: INRIX 2019 Global Traffic Scorecard

A Better City recommends that MassDOT consider implementing a series of measures in the near-, mid-, and long-term that could help minimize or eliminate traffic disruption, maintain and improve access to the inner core, and protect the economic vitality of the region. [11]

Near-Term (before 2025)

1) **Leverage and blend** all available resources, when possible, to fund mitigation recommendations.

2) Develop and implement a robust, multilingual, multimedia **Public Engagement and Communications Strategy.**

3) Offer **Fare Incentives,** including free fares on the **Framingham/Worcester Commuter Rail Line** stations and parking lots, free Express Bus Service from MassDOT Park and Ride lots.

4) **Expand parking,** where possible, at **lots along the Framingham/Worcester Commuter Rail Line** and **Address Employer Parking Subsidies.**

5) Develop and implement a **Managed Lane Pilot** that would test viability on I-90 sub-segment 8 (I-495-Hopkinton – MA30-Auburndale), accrue dedicated revenues to provide free Express Bus and Commuter Rail service for the duration of the I-90 project, and pay for any associated infrastructure updates to implement.[12]

6) Provide free **Express Bus** service from **MassDOT Park and Ride Lots along I-90** (from Auburn to Weston).

Mid-Term (2025-2030)

7) **Complete Initial Upgrades to Framingham/Worcester Commuter Rail Line** such as adding high level platforms by Q3 2025.

8) **Install Triple Track along Framingham/Worcester Commuter Rail Line,** which may be available to contribute to mitigation for the Multimodal Project later during the construction period, if possible, to expand express service and reduce travel times.

9) Place **West Station into service as early as possible during the construction period**.

Long-Term (2030 to 2040+)

10) **Electrify the Framingham/Worcester Commuter Rail Line** (partial and full line) as soon as possible, to provide faster, more reliable bi-directional regional rail service with 15-minute headways and 60-minute headways between Worcester and Boston.

The ten recommendations provide the basis for future discussion and action as more information becomes available about the construction staging and sequencing of the I-90 Allston Multimodal Project, including deeper analysis on the associated transportation impacts, to determine the most effective mitigation measures to address the nature and level of impacts.

The recommendations may also help defray mitigation costs, modernize the Commonwealth's public transit rail infrastructure, incentivize short- and potentially permanent mode shift from personal vehicles to public transportation, expand public transit access and options, address equity concerns, reduce congestion, prevent construction sequencing conflicts, and support attainment of statewide decarbonization goals by 2050.

Timeline

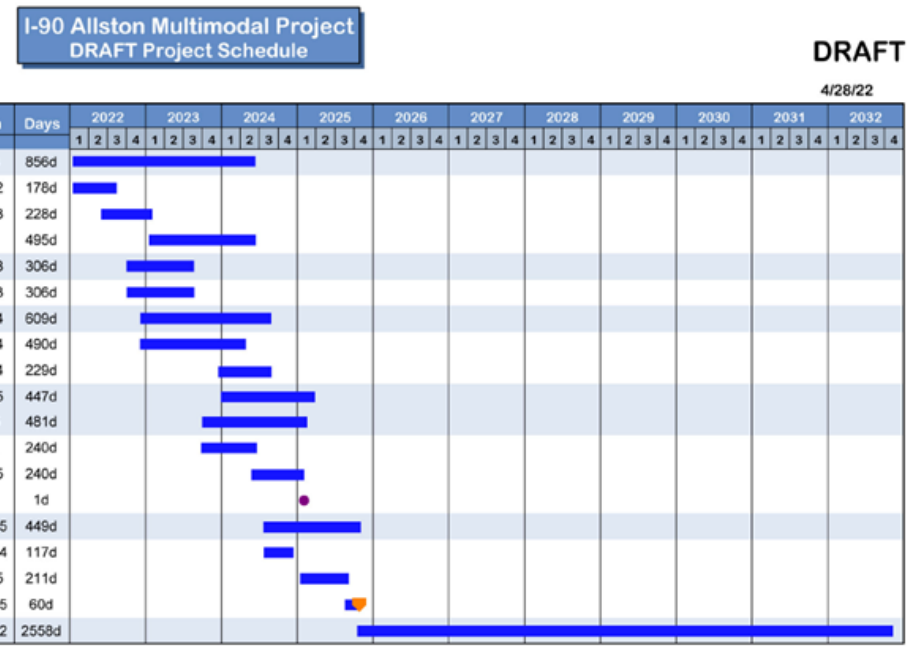
The project schedule included in the I-90 Allston Multimodal Project FY2022 Multimodal Project Discretionary Grant Application estimated final design and construction to begin in the third quarter of 2025 (Table 2). This timeline may change once funding is secured for the project. Regardless, mitigation actions to address traffic disruption and general mobility into the inner core should be completed, if possible, before the multimodal project begins.

Table 2: Tentative I-90 Allston Multimodal Project Schedule

I-90 Allston Multimodal Project
DRAFT Project Schedule

DRAFT
4/28/22

WBS	TASKS	Start	Finish	Days
1	**Massachusetts Environmental Policy Act**	2/1/22	6/5/24	856d
1.1	Notice of Project Change (NPC)	2/1/22	7/28/22	178d
1.2	Supplemental Draft Environmental Impact Report (SDEIR)	6/15/22	1/28/23	228d
1.3	Final Environmental Impact Report (FEIR)	1/28/23	6/5/24	495d
2	**Interchange Modification Report**	10/11/22	8/12/23	306d
2.1	Interchange Modification Report (IMR)	10/11/22	8/12/23	306d
3	**National Environmental Policy Act**	12/15/22	8/14/24	609d
3.1	Draft Environmental Impact Statement (DEIS)	12/15/22	4/17/24	490d
3.2	Final Environmental Impact Statement / Record of Decision	12/30/23	8/14/24	229d
4	**Environmental Permits**	1/3/24	3/24/25	447d
5	**Preliminary Design**	10/10/23	2/1/25	481d
5.1	Pre 25% Design (Permit Support)	10/10/23	6/5/24	240d
5.2	Base Technical Concept (BTC) / 25% Design	6/5/24	1/30/25	240d
5.3	Schedule and Conduct Design Public Hearing	2/1/25	2/1/25	1d
6	**Design Build Procurement**	8/5/24	10/27/25	449d
6.1	Phase 1 -Request for Qualifications (RFQ)	8/5/24	11/29/24	117d
6.2	Phase 2 -Request for Proposals (RFP)	1/30/25	8/28/25	211d
6.3	Anticipated Notice to Proceed (NTP)	8/29/25	10/27/25	60d
7	**Final Design/Construction**	10/28/25	10/28/32	2558d



Source: MassDOT and City of Boston I-90 Multimodal Project: FY2022 Multimodal Project Discretionary Grant Application, submitted on May 23, 2022.

There are infrastructure improvements suggested in the report that are currently in the design phase or under construction. Some of the projects are slated for completion during the construction on the I-90 Allston Multimodal project, which could further aggravate anticipated disruption to traffic, i.e., expected loss of 25% of lane capacity and decreased speeds[13], while others do not (Table 3). When possible, and if feasible, the projects that overlap with I-90 construction should be accelerated to allow for completion before Q3 2025.

Table 3: Construction Sequencing Problems – I-90 Allston Multimodal Project Mitigation

INFRASTRUCTURE IMPROVEMENT	STAGE	START DATE	COMPLETION DATE	COST $	SEQUENCING CONFLICT
FRAMINGHAM / WORCESTER TRIPLE TRACK	Design	2021	2030	$399-$406M	Yes
FRAMINGHAM / WORCESTER LINE ELECTRICICATION	Planning/Rail Transformation	Tentative 2031	Tentative 2040	$249M	Yes
NEWTON STATIONS ACCESSIBILITY IMPROVEMENTS (AUBURNDALE WEST NEWTON NEWTONVILLE)	Design (30%)	2019	2024 to 2027	$129M	Potentially if completion is after 2024
WEST STATION*	Planning/Rail Transformation	N/A	N/A	N/A	Yes
WORCESTER UNION STATION IMPROVEMENTS	Construction	2021	Winter 2023	$45M	
NATICK STATION ACCESSIBILITY IMPROVEMENTS	Construction	2019	2024	$36.2M	
ATC/PTC SIGNALS	Complete	2020	2020	N/A	
BRIDGES & HIGHWAYS (BACON STREET AND INTERVALE ROAD BRIDGES	Construction	2019	Summer 2022	$30M	

Sources: Worcester Triple Track Design Professional Services Contract (mbta.com); http://transitmatters.org/regional-rail-phase-1; Newton Commuter Rail Stations Accessibility Improvements October 13 Virtual Public Meeting Presentation (mbta.com); Newton Commuter Rail Stations Improvements (mbta.com); Worcester Union Station Improvements | Projects | MBTA; Natick Center Station Accessibility Improvements | Projects | MBTA; https://www.mbta.com/projects/rail-bridge-replacements#bacon; https://www.mbta.com/projects/rail-bridge-replacements#intervale; https://www.mbta.com/projects/commuter-rail-positive-train-control-ptc

Note: TransitMatters estimates a timeline for completion of Triple Track and West Station by 2025 if construction begins in 2024, page 12

Recommendations

To figure out the most effective mitigation measures to address the nature and level of impacts, more information is needed on the construction staging and sequencing of the I-90 Allston Multimodal Project, including deeper analysis on the associated transportation impacts. The following ten recommendations offer a starting point and provide a menu of mitigation measures to address potential transportation impacts associated with the I-90 Allston Multimodal Project. They are divided into three categories: 1) near term (before 2025); mid-range (2025-2030); and long-term (2030 to 2040+).

A Better City recognizes that there are significant hurdles to accelerating and completing some of the recommendations proposed in this report, especially those related to construction projects. Table 4 assesses the feasibility of projects, i.e., "Easier to Accomplish" to "Harder to Accomplish", and their importance to I-90 Allston Multimodal Project traffic and economic disruption mitigation, i.e., "essential to mitigation" and "beneficial to mitigation".public transit rail infrastructure, incentivize short- and potentially permanent mode shift from personal vehicles to public transportation, expand public transit access and options, address equity concerns, reduce congestion, prevent construction sequencing conflicts, and support attainment of statewide decarbonization goals by 2050.

Table 4: Implementation Feasibility Comparison - Recommendations

FEASABILITY	ESSENTIAL MITIGATION	BENEFICIAL TO MITIGATION
EASIER TO ACCOMPLISH	**Recommendation 2:** Public Outreach & Communications Strategy **Recommendation 5:** Managed Lane Pilot **Recommendation 6:** Express Bus Service from MassDOT Park and Ride	**Recommendation 3:** Fare Incentives (including free fares, free parking)
HARDER TO ACCOMPLISH	**Recommendation 1:** Leverage and Blend Funding Resources **Recommendation 4:** Expand Parking at Commuter Rail Lots - **Recommendation 1:** Leverage and Blend Funding Resources **Recommendation 4:** Expand Parking at Commuter Rail Lots	**Recommendation 4:** Address Employer Parking Subsidies **Recommendation 7:** Complete Initial Upgrades to the Framingham/ Worcester Line **Recommendation 8:** Install Triple Track on the Framingham/ Worcester Line **Recommendation 9:** Place West Station into service as early as possible during the construction period. **Recommendation 10:** Electrify the Framingham/Worcester Commuter Rail (partial and full line) as soon as possible

Source: Author

Near-Term (before 2025) Recommendations

Recommendation I: Leverage and Blend All Available Financing Sources for I-90 Allston Multimodal Project Mitigation

The I-90 Allston Multimodal Project is estimated cost over $2 billion, including $1,426,681,171 for construction and $558,459,259 for design, right-of-way and other soft costs.[14] A blending of financial resources will be pooled to cover the cost of implementation. These include federal funding ($1.2 billion MEGA grant for pre-construction and construction, comprising 60% of the project cost[15]), and state, city, third party, and other funding ($794,056,172 million, or 40% of project cost[16]).

Table 5: I-90 Allston Multimodal Project Budget Summary

	FEDERAL RESOURCES	NON-FEDERAL RESOURCES	TOTAL
PHASE/COST DESCRIPTION	MPDG Mega ($M)	Commonwealth, City, Third Party, Other ($M)	($M)
PRELIMINARY DESIGN	--	$106.46	$106.46
CONSTRUCTION PHASE DESIGN	--	$21.79	$21.29
FINAL DESIGN (DB CONTRACT)	$49.74	$70.91	$120.65
RIGHT OF WAY/LAND ACQUISITION	--	$11.02	$11.02
FORCE ACCOUNTS*	--	$63.28	$63.28
ADMINISTRATIVE COSTS**	--	$90.98	$90.98
CONTINGENCY (35%)	--	$144.79	$144.79
NON-CONSTRUCTION TOTAL	$49.74	$508.79	$558.46
CIVIL & STRUCTURE - DESIGN/BUILD	$499.35	$124.84	$642.19
PEDESTRIAN STRUCTURES	$20.90	$5.22	$26.12
PDW PATH	$5.90	$1.48	$7.38
OPENSPACE/ LANDSCAPING	$2.41	$.60	$3.01
UTILITY RELOCATION	$3.72	$.93	$4.64
ESCALATION & INDIRECT COSTS***	$313.8	$78.29	$391.47
CONTINGENCY (35%)	$295.90	$73.98	$369.88
CONSTRUCTION TOTAL	$1,141.34	$285.34	$1,426.68
TOTAL PROJECT COSTS	$1,191.08	$794.06	$1,985.14

Source: MassDOT and City of Boston I-90 Multimodal Project: FY2022 Multimodal Project Discretionary Grant Application, submitted on May 23, 2022.

The project budget does not include funding for the mitigation actions recommended in this report. Additional funds need to be identified and allocated to implement the necessary measures to address traffic and economic disruption during the project. Here again, a blending of resources will be necessary, leveraging funds from the current and future MBTA and MassDOT Capital Investment Plans (CIP) (Regional Rail Electrification, Framingham/Worcester Line upgrades, etc.), seeking additional funds to accelerate work (Bipartisan Infrastructure Bill competitive grants, Transportation Bond Bill), dedicating funds from mitigation measures such as managed lane revenue, and exploring innovative partnerships with the private sector that could result in public-private-partnerships.

FY2023-2027 and Future Capital Investment Plans

Estimates show that implementation of Phase I by 2026, excluding the Framingham/Worcester Line, could cost ~2.6 billion, including Regional Rail costs, electrification, platforms, right-of-way expansion, tracks & signals.[17] The five year FY23-27 MBTA Capital Investment Plan (CIP) allocates $65.1 million to Rail Transformation—a fraction of the funding required for Phase I—primarily focused on design and planning studies with little allocated to construction.[18] The MBTA should consider adding further resources to advance projects that have a good chance of winning competitive federal infrastructure grants that are available now and will continue to be an option in the next four years.

Table 6: MBTA FY23-27 CIP Rail Transformation Projects

PROJECT	FY23-27 SPEND	DESCRIPTION
RAIL TRANSFORMATION PLANNING STUDIES (P0934)	$5.5M ($13M total authorized budget with $7.5M spent on Technology Study – Completed in 2022; and $4.5M on Strategic Planning & Rail Vision – Completed 2019)	Planning re-procurement Service Planning – Fairmount Line Frequency Improvement
FUTURE ROLLING STOCK FLEET (P0918)	$49.9M ($50M total authorized budget)	Planning future procurement of electrified or multi-mode Commuter Rail rolling stock -RFI Process 6 months -Decision to procure late FY2023 -Develop Request for Proposals & performance requirements 6-9 months -Planning/feasibility for electrified service Boston-Providence
RAIL TRANSFORMATION – EARLY ACTION ITEMS (P0940)	$9.5M ($10M total authorized budget)	-30min Brandeis/I-95 Urban Service (Fitchburg Line) - 30min Reading Highlands Urban Service (Haverhill Line) -Beverly Urban Service Resiliency (Environmental Justice Corridor) -Investigating 30 min Anderson/Woburn Urban Service (Lowell Line)
SOUTH SIDE MAINTENANCE FACILITY PROJECT	Est. Cost = $400+M, Federal Investment Request = $245M	Design and construction of a new heavy maintenance facility on South Side of Commuter Rail system to: 1) Overcome operational challenges that plague the repair and maintenance of the South Side fleet; 2) Expand maintenance capacity and improve system resiliency; 3) Offer flexibility to adapt facility to service possible future electrified fleet

Source: MBTA FY23-27 CIP

Bipartisan Infrastructure Law

There are significant funds available through the Bipartisan Infrastructure Law (BIL) to support the I-90 Allston Multimodal Project as well as items identified to mitigate potential traffic disruption, including implementation and acceleration of the Regional Rail project and Framingham/Worcester Line upgrades. Funding for the project was not awarded as part of the first round of BIL grants. Further, the Federal Department of Transportation did not recommend funding for this project. They raised concerns about the cost-effective nature of the project, if Massachusetts can support the state's share of the project's cost, and if MassDOT currently has the legal, financial, and technical capacity to carry out the project. Fortunately, these concerns can be addressed in a future application.

Table 7 provides a list of BIL and other competitive discretionary grants that may be well suited for I-90 Allston and transformational projects to mitigate traffic disruption. Mass/DOT and the MBTA should take proactive measures to create a team dedicated to this process.

Table 7: Federal BIL Funding Opportunities

	NOTICE OF FUNDING OPPORTUNITY (NOFO)	AUTHORIZED FUNDING ($) FY22-FY26
MULTIMODAL PROJECT DISCRETIONARY GRANT PROGRAM (INFRA, MEGA, AND RURAL)	March 2022	$1.5 Billion
CONSOLIDATED RAIL INFRASTRUCTURE & SAFETY IMPROVEMENTS (CRISI)	Anticipated August 2022	$1 Billion/Year
FEDERAL-STATE PARTNERSHIP FOR INTERCITY PASSENGER RAIL GRANTS	Anticipated October 2022 (National) and December 2022 (Northeast Corridor)	$1.5 Billion/Year
CAPITAL INVESTMENT GRANTS	Next Funding Cycle (FY24) Date Unknown	Expected $4.45 Billion
REBUILDING AMERICAN INFRASTRUCTURE WITH SUSTAINABILITY AND EQUITY (RAISE)	Next Funding Cycle (FY24) Date Unknown	$1.5 Billion

Source: Upcoming Notice of Funding Opportunities Announcements in 2022 and MEGA, CRISIS; Federal-State Partnership for Intercity Passenger Rail Grants; Capital Investment Grants; RAISE; Restoration and Enhancement Grant

Note: This table provides an overview of BIL grant submissions that support Regional Rail or upgrades to the Framingham/Worcester Line only. It is not representative of the full list of grant submissions by the MBTA or MassDOT.

Fair Share Revenue

In November 2022, voters approved the Question 1 ballot question, which amended the Massachusetts Constitution to add an additional tax surcharge on income over one million dollars. This is often referred to as the "Millionaire's Amendment" or "Fair Share" amendment with the new revenue promised for transportation and education programs. This new annual program certainly presents a new option for transformational capital infrastructure projects, like the I-90 Multimodal project.

Based on initial estimates, the Fair Share revenue is expected to generate between $1.4 - $1.7 billion dollars in fiscal year 2024, with similar amounts expected in future years. The breakdown of the funding between transportation and education programs will be determined during the state budget process; however, A Better City has asked that the money be used equally between these two policy areas. It is also an opportunity to create a new annual borrowing program for transportation infrastructure that that can match future federal grants, address needs at the MBTA, and take advantage of recently passed transportation bond bills.

Public-Private-Partnerships

The MBTA/Mass DOT could pursue public-private partnerships (P3s) as one source of financing I-90 mitigation. The recent A Better City reports, Public-Private Partnerships for the Massachusetts Bay Transit Authority and Station Redevelopment for the MBTA, outline how P3s can offer transit agencies an opportunity for more cost-effective delivery of capital projects and their transit services. Successfully implemented P3s offer a combination of greater cost and schedule certainty, lower lifetime costs, faster design, construction and startup of service, state-of-the-art technology, and reliable and consistent service quality for periods up to thirty years or longer. The two major federal credit support programs for transit P3s are TIFIA and RRIF, both of which MBTA has already used. Its $517 million Positive Train Control project has a TIFIA loan of $162 million and a RRIF loan of $220 million.[19]

Recommendation 2: Develop and Implement Public Engagement & Communications Strategy

Developing and implementing a robust public engagement and communications strategy will be an important measure to inform the public on what is planned, when it is planned, the duration of work, how people will be affected, what alternatives are available, etc. Targeting communications to all communities (within and outside Greater Boston) and types of transit users (vehicle drivers, commercial vehicles/trucks, public transit users by mode, bikers, etc.) will help identify optimal mitigation measures. The timing of the campaign, i.e., early, proactive, and frequent approach, will also be an important factor in raising awareness and hopefully reducing any negative impacts.

There is an existing Allston I-90 Task Force made up of a broad range of stakeholders, including residents, business representatives, advocacy groups, amongst others. This group could be expanded for better geographic and transportation mode representation, which would help to ensure that the broad range of communities impacted by the project are part of the discussion. A Mitigation Task Force could also be established to focus solely on this issue. If created, it could encompass the broader representation of stakeholders, with significant participation from groups beyond the corridor, including the Massachusetts Planning Organization, as well as current Task Force members.

The Mitigation Task Force or standing Allston I-90 Task Force could work with the MassDOT communications team and/or private public relations firm to develop a comprehensive, inclusive, deadline driven, and multi-media and multi-lingual, two-way, public engagement and communications strategy that relays information and allows for stakeholder feedback throughout the pre-construction and construction process.

Recommendation 3: Offer Fare Incentives to Promote Mode Shift

Compared to other transit systems the MBTA has some of the highest fares in the United States (Table 8). The development of fare and parking pricing incentives, including free or lower transit fares and parking fees during the I-90 Allston Multimodal Project could help to induce demand and incentivize mode shift, i.e., shift from autonomous vehicles to the commuter rail or other public transit options, i.e., MassDOT Park and Ride Express Buses (Recommendation 6). These measures could all also create more equitable outcomes for both low- and middle-income commuters by removing the cost barrier to use, which often is a significant factor influencing choice of transit mode and encourages a long-term shift.[20] Addressing employer parking subsidies during the project (and beyond) could also promote behavior change (Recommendation 4).

Table 8: Comparative Overview: Commuter Rail Pricing (MBTA vs. Peer Agencies)

	METROLINK LA		CAPMETRO (TX)		CTRAIL HARTFORD LINE (CT)		SEPTA (PA)		MBTA COMMUTER RAIL (MA)
CATEGORY	Cost ($)	% Discount	Cost ($)	% Discount	Cost ($)	% Discount	Cost ($)	% Discount	Cost ($)
AVG ONE-WAY	$9.38	-1%	$3.50	62%	$7.75	17%	$6.80	27%	$9.29
AVG MONTHLY	$211.80	27%	$96.25	67%	$162.74	44%	$96.00	67%	$290.82
ROUTE MILES	412		32*		121		280		388**
NUMBER OF ZONES	N/A		N/A		7		4		11

Sources: https://metrolinktrains.com/ticketsOverview/ticket-info/price-finder/; https://www.capmetro.org/fares-passes; https://www.hartfordline.com/fares-schedules/ticketing; http://www.septa.org/fares/; and https://www.mbta.com/fares/commuter-rail-fares

Notes: *The CapMetro (TX) line example included is comparable to the Framingham/Worcester Line in terms of route miles.**The MBTA Framingham/Worcester Line runs along 44.3 route miles.

Commuter Rail Fares: Framingham/Worcester Line

Transit's main competition is private automobile. Ridership numbers can increase by reducing fare prices to be more competitive with automobile use.[21] Therefore, offering free or reduced fares for peak hour service on the Framingham/Worcester Commuter Rail Line (both within and outside of Rte. 128) during the I-90 Allston Multimodal Project, may incentivize commuters who normally use personal automobiles shift to the Commuter Rail instead. This would reduce the number of automobiles on I-90, alleviating congestion that could further aggravate traffic flow and disruption. The recommended upgrades to the line would provide more frequent, reliable, and faster service, which could also encourage transit use for commuters.[22]

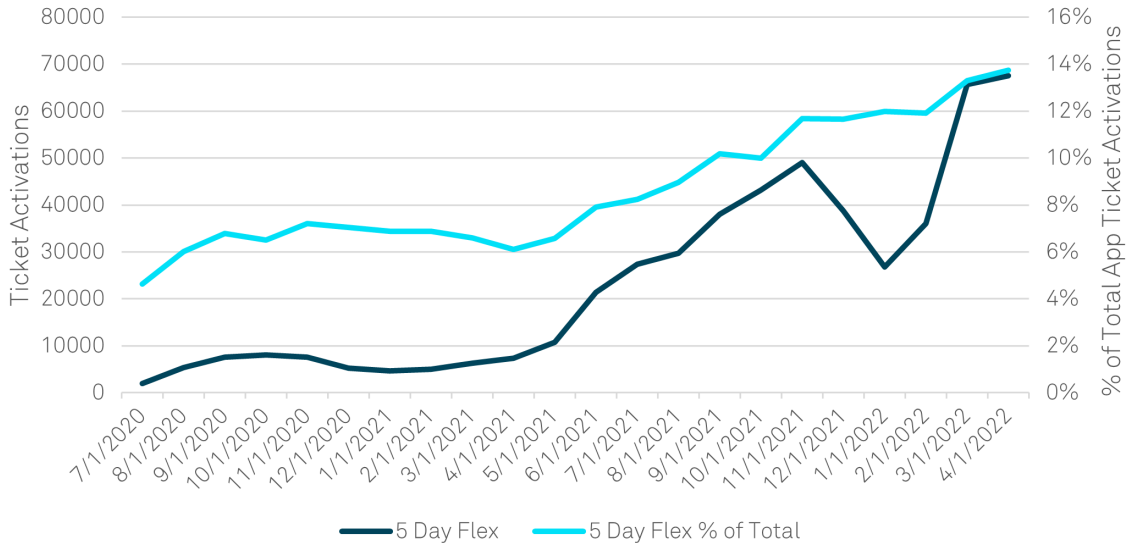
Recommendation 5 in this report calls for the development and implementation of a Managed Lane Pilot, which would generate revenue from either dynamic or time of day pricing that could be dedicated to cover I-90 mitigation measures, including free Commuter Rail fares on the Framingham/Worcester Line, etc.

Box I: Fare Products that Grow Ridership by Meeting Customer Needs

The MBTA has experimented with innovative fare products and incentives in the past to attract riders and respond to changing demand. The Commuter Rail $10 Weekend Pass, which allows unlimited rides over the course of a single weekend (without transfers) is one example and success story. MBTA officials noted that, "The T sold about 180,000 of the passes since June [2018], making up about 23 percent of overall weekend revenue during the test. During the course of the pilot, weekend commuter rail revenue grew compared with the same period in 2017 by about 4.6 percent."

The 5-day Flex Pass launched in July 2020 is another example. The MBTA created the product in response to changing commuting patterns during the pandemic and the anticipated transition back to the workplace. The pass is valid for 30 days and offers a 10% discount as well as unlimited travel during a 24-hour period. Its popularity has increased over time, and in April 2022, it represented 14% of all mTicket sales (Figure 4).

Figure 4: mTicket 5-Day Flex Pass



Source: Personal communication, MBTA, Fare Transformation Team, June 2022; https://massdot.app.box.com/v/commuterrailfarestudy;https://www.bostonglobe.com/metro/2018/12/10/the-mbta-weekend-commuter-rail-discount-went-pretty-well-but-now-over/owaGoNZBdyaJKdni4kTiSN/story.html

Note: Figure xx illustrates activations on the mTicket app. In April 2022, the mTicket Flex Pass represented 14% of all mTicket sales, followed by 10-Ride (12%), and mTicket monthly pass (6%). One way (33%) and round-trip tickets (27%) continue to make up a higher percentage of sales.

Source: Personal communication, MBTA, Fare Transformation Team, June 2022

Recommendation 4: Eliminate Parking Fees and Expand Access at Commuter Rail Parking Lots & Address Employer Parking Subsidies

The I-90 project may further aggravate congestion that the Commonwealth and Boston already experience. Paying for parking at commuter rail lots is an added expense for commuters choosing public transit. Pricing along the Framingham/Worcester Line runs between $153/month to $53/month. Pre-COVID parking capacity at commuter rail stops along the Framingham/Worcester Line was an issue at some of the stations, with many lots operating at close to capacity (Table 9). Reducing or eliminating parking fees at commuter rail lots along the Framingham/Worcester Line could help to promote mode shift.[23]

In addition, when possible, expanding commuter rail lots to accommodate additional riders, could increase demand for public transit service. Table 9 shows the potential for expansion at lots along the line; however, further analysis is required to determine where there are opportunities to build and/or expand parking to meet additional demand as well as to explore and identify Commuter Rail parking lots along the Framingham/Worcester Line that could service as drop-off points for Express Buses from MassDOT Park and Ride lots (Recommendation 4).

Table 9: Parking at Commuter Rail Lots along Framingham/Worcester Line

	INSIDE 128	RIDERSHIP 2018 (INBOUND)*	PARKING	OPERATOR	PARKING CAPACITY	UTILIZATION	AVAILABLE EX-PANSION LOTS	COST (MONTH)
WORCESTER	N	1,298	Y	MBTA	509	63%	NO	$153.00
GRAFTON	N	524	Y	MBTA	386	67%	NO	$70.00
WESTBOROUGH	N	737	Y	MBTA	448	96%	YES	$105.00
SOUTHBOROUGH	N	518	Y	MBTA	372	95%	YES	$105.00
ASHLAND	N	907	Y	MBTA	693	80%	YES	$70.00
FRAMINGHAM	N	995	Y	MBTA	294	95%	NO	$70.00
WEST NATICK	N	904	Y	MBTA	178	97%	NO	$105.00
NATICK CENTER	N	697	Y	Town	83	52%	NO	N/A
WELLESLEY SQUARE	N	591	Y	Town	224	62%	MAYBE	$129.72
WELLESLEY HILLS	N	322	Y	Town	68	100%	NO	$129.72
WELLESLEY FARMS	N	285	Y	Town	194	100%	YES	$129.72
AUBURNDALE	Y	203	Y	MBTA	35	89%	NO	$129.72
WEST NEWTON	Y	249	Y	MBTA	206	60%	NO	$86.48
NEWTONVILLE	Y	429	N	MBTA	80	85%	NO	N/A
BOSTON LANDING	Y	479	N	N/A	0	N/A	N/A	N/A
LANDSDOWNE	Y	N/A	N	N/A	0	N/A	N/A	N/A
BACK BAY	Y	N/A	N	N/A	0	N/A	N/A	N/A
SOUTH STATION	Y	N/A	Y	Private	210	N/A	N/A	N/A

Source: Spring/Fall 2018 CTPS Commuter Rail Passenger Counts; MBTA Park and Ride Dashboard; MBTA Parking Lot Station and Rates

Note: *Pre-COVID ridership

Pre-COVID-19, many companies offered parking subsidy benefits to employees. This practice increased during the pandemic, with employers citing safety concerns and employee comfort. It is not, however, a viable policy for several reasons, including but not limited to lowering driving costs and incentivizing driving, and should be eliminated to support state-wide decarbonization goals and mode shift to public transit or active transportation modes[24]. Further, if continued, it could be counterproductive to any mitigation measures adopted for the I-90 Allston Multimodal Project and add to congestion.

As relates to Framingham/Worcester Line, employer parking subsidies narrow the savings gap between driving and taking the Commuter Rail (Table 10). Using 2021 gas prices, taking the Commuter Rail yields minimal savings over driving with an employer parking subsidy and for Zone 3, the Commuter Rail costs more.

Table 10: Employer Parking Subsidies Deter Commuter Rail Use

	COMMUTER RAIL SAVINGS VS. DRIVING (W/EMPLOYER)
2021	
WELLESLEY SQUARE ZONE 3	(35.38)
WEST NATICK ZONE 4	$18.42
FRAMINGHAM ZONE 5	$35.52
SOUTHBOROUGH ZONE 6	$10.44
WESTBOROUGH ZONE 7	$55.73

Sources: Author based on research for A Better City (2021), Making Fares Work: Fare Promotions & Products for the Hybrid Commute; https://www.mbta.com/fares/commuter-rail-fares; https://www.mbta.com/pass-program/perq; https://www.mbta.com/parking/stations-and-rates; https://turnpikeinfo.com/toll-calculator.php?road_name=massachusetts-turnpike&state=massachusetts; https://www.gsa.gov/travel/plan-book/transportation-airfare-pov-etc/privately-owned-vehicle-pov-mileage-reimbursement-rates;https://gasprices.aaa.com/aaa-gas-cost-calculator/

Note: Cost of MBTA Monthly Pass (by zone) and cost of Commuter Rail lot parking (by month, zone) and cost of driving (miles by zone, tolls, gas) with employer parking subsidy (monthly Boston parking rate $255 with 33% subsidy)

Recommendation 5: Pilot Managed Lanes on I-90 from Sub-Segment 8 (I-495 – Hopkinton to MA-30 - Auburndale)

The concept of managed lanes is not new to Massachusetts. The Commonwealth has high-occupancy vehicle (HOV) lanes on I-93 North of Boston and on the Southeast Expressway using different techniques, including buffer separated HOV lanes, HOV lanes with direct access to streets, reversable "zipper" lanes. The HOV lanes are open to vehicles with two or more occupants, including cars, buses, vans, and taxis.[25] At present, the state's managed lanes are only used to reduce congestion; however, managed lanes can be used to raise revenue. MassDOT could implement a managed lane pilot ahead of the test viability and generate revenue to offset mitigation measures such as free express bus and Commuter Rail service.

In 2020, MassDOT published a managed lane screening study, Congestion in the Commonwealth: Managed Lanes Screening Study - 2020, to 1) develop a list of "Success Factors" through both a literature review of relevant national guidelines for implementing managed lanes and from discussions with other state DOTs who have implemented similar projects; 2) perform an initial screening of the roadways within the I-495 beltway to assess which corridors warrant further evaluation for a managed lanes treatment; and 3) evaluate those identified corridors to determine which managed lanes treatment is most appropriate and determine analysis requirements for future detailed study.[26]

Table 11: Scoring Managed Lanes

	Segment Limits												
	I-495		I-95	I-95 / MA-128		I-93		I-90	MA-2	MA-24	US-1	MA-3	US-3
Criteria	US-3 and MA-213 (Segment 1)	I-290 and I-90 (Segment 2)	I-495 and I-93/I-95 (Segment 3)	I-95/I-93 and MA-2 (Segment 4)	MA-2 and US-1 (Segment 5)	I-95/MA-128 and I-90 (Segment 6)	US-1 and NH State Line (Segment 7)	I-495 and MA-1A (Segment 8)	I-95 to Alewife Brook Pkwy (Segment 9)	MA-27 and I-93 (Segment 10)	I-93 and I-95/MA-128 (Segment 11)	MA-139 and I-93 (Segment 12)	I-95/MA-128 and NH SL (Segment 13)
Network Connectivity	1	2	1	2	2	1	1	1	1	2	1	2	1
Level of Congestion	1	1	2	2	2	2	2	2	2	2	2	2	2
Travel Time Variability	1	1	1	1	2	2	1	1	1	1	1	1	1
Person Throughput	1	1	1	1	1	2	2	2	1	1	2	2	2
Projected Traffic Growth	0	0	2	2	1	1	2	1	1	1	0	0	2
Transit	0	0	0	1	1	2	2	2	2	1	2	1	1
TOTAL SCORE	4	5	7	9	9	10	10	9	8	8	8	8	9

Scoring

More Suitable	2
Adequate	1
Less Suitable	0

Source: MassDOT (2020), Congestion in the Commonwealth: Managed Lanes Screening Study

Note: More Suitable – 2; Adequate – 1; Less Suitable – 0. A score of 8 or above was identified as adequate to consider managed lanes treatments on the corridor, while a score of less than 6 removed a corridor from further consideration. Corridors with a score of 6 or 7 could be suitable for managed lanes treatments or other congestion management strategies in the future but are not recommended to advance at this time.

The results of the study show that given the characteristics of the I-90 sub-segments near Boston (Table 12), i.e., narrow to no shoulders or "right-of-way" opportunities, creating HOV lanes is not feasible; however, managed lanes are feasible and could be tested on the 35 mile sub-segment from I-495 (Hopkinton) to MA-30 (Auburndale) or a section thereof.[27]

Table 12: Managed Lane Feasibility on I-90

Corridor	Sub-Segment	S or W Endpoint	N or E Endpoint	Feasible	Typical Section	Comments
	7C	US-1 (Boston)	I-95/MA-128 (Woburn)	✓	●	• Current bus-on-shoulder pilot in the SB direction north of Exit 28 – Sullivan Square (Boston)
I-90	8A	I-495 (Hopkinton)	I-95/MA-128 (Newton)	✓	●●	• Feasible from I-495 (Hopkinton) to MA-30 (Auburndale)
	8B	I-95/MA-128 (Newton)	MA-1A (Boston)	X	N/A	• Much of the corridor is near Boston and extremely constrained with infrastructure and little to no right-of-way opportunities

Source: MassDOT (2020), Congestion in the Commonwealth: Managed Lanes Screening Study

The Federal Government guidelines regarding managed lane fees allow for fixed pricing, pricing varying by time of day or dynamic pricing, or pricing varying in response to real-time traffic conditions. In all cases, tolls are higher during peak demand periods and rates must be clearly posted near entry points to alert motorists of the fees. Pricing varies across the country, but the federal approval process requires that pricing algorithms used achieve an approximate travel sped of 45 mph in the managed lanes for 90% of the time applied.[28]

Table 13: Examples of Managed Lane Tolling in the United States

Agency	Corridor	Length (mi)	Cross-Section[1]	Separation Type	Toll Rate Type	Conversion	Transit Present	Enforcement Type
CDOT	US 36	16	6 lanes: 4 GPL, 2 EL	Striped/ Concrete Barrier	Dynamic Pricing	HOV to HOT	Bus	Manual
CDOT	I-25	5	10 lanes: 4 GPL, 2 REL	Concrete Barrier	Time of Day	HOV to HOT	Bus	Manual
CDOT	I-70 Mountain	13	6 lanes: 4 GPL, 2 EL	Striping	Dynamic Pricing	Shoulder to Express Lane	No	Manual
WSDOT	SR-167	21	6 lanes: 4 GPL, 2 EL	Barrier Separated	Dynamic Pricing	HOV to HOT	Bus	Manual
WSDOT	I-405	30	6 lanes: 4 GPL, 2 EL	Barrier Separated	Dynamic Pricing	HOV to HOT	Bus	Manual
MnDOT	I-394	9.8	6 lanes: 4 GPL, 2 EL and 8 lanes: 6 GPL, 2 REL	Striping	Dynamic Pricing	HOV to HOT	Bus	Manual
HCTRA	I-10	1	12 lanes: 10 GPL, 2 EL and 14 lanes: 10 GPL, 4 EL	Striping/ Pylon Separated	Time of Day	HOV to HOT	Bus	Manual
VDOT	I-395/I-95	35	8 lanes: 6 GPL, 2 REL and 11 lanes: 8 GPL, 3REL	Barrier Separated	Dynamic Pricing	HOV to HOT	Bus	Manual
FDOT	I-95	21	12 lanes: 8 GPL, 4 EL	Stripping/ Pylon Separated	Dynamic Pricing	HOV to HOT	Bus	Manual
FDOT	I-75	22	12 lanes: 8 GPL, 4 EL	Striping/ Pylon Separated	Dynamic Pricing	HOV to HOT	Bus	Manual
RCTC	SR-91	18	12 lanes: 8 GPL, 4 EL 14 lanes: 10 GPL, 4 EL	Stripping/ Pylon Separated	Time of Day	New Construction HOV to HOT	Bus	Automated Manual
UDOT	I-15	17	12 lanes: 10 GPL, 2 EL	Striping	Time of Day	HOV to HOT	Bus	Manual
GDOT/ SRTA	I-85	10	14 lanes: 12 GPL, 2 EL	Striping	Dynamic Pricing	HOV to HOT	Bus	Manual
GDOT/ SRTA	NW Corridor (I-75/I-575)	29.7	10 lanes: 4 GPL, 2 REL	Barrier Separated	Dynamic Pricing	HOV to HOT	Bus	Manual
GDOT/ SRTA	I-75	12	12 lanes: 8 GPL, 4 REL and 10 lanes: 8 GPL, 2 REL	Barrier Separated	Dynamic Pricing	HOV to HOT	Bus	Manual

[1] GPL – General Purpose Lanes, EL – Express Lanes, REL – Reversible Express Lanes

Source: MassDOT (2020), Congestion in the Commonwealth: Managed Lanes Screening Study

Massachusetts currently uses All-Electronic Tolling (AET) and has high penetration rates for EZ-Pass users (85-90 percent); therefore, rolling out a managed lane tolling system would not require extension infrastructure investments but may require new software.[29] Initially, all or a portion of the pilot revenue could be allocated to reimbursing the pilot costs, i.e., capital costs, operations, maintenance, and then could be designated to defer the costs of the Allston Multimodal Project traffic mitigation measures.

Additional work would be required to better understand the true feasibility of managed lanes for the sub-segment, not least the potential equity and environment impacts associated with implementation of a mechanism that allocates a fee for service related to the use of lanes.

Recommendation 6: Provide Express Bus Service from Select MassDOT Park and Ride Lots

There are five MassDOT operated Park and Ride lots along the I-90 corridor from Worcester to Boston. At present, only one lot Framingham offers local bus service and a shuttle service to Logan airport (Logan Express). No current data are available on utilization—the last study was done in 2015 by CTPS and provides information from 2005 to 2007 for a select number of lots. Only one of the lots Framingham was long the I-90 corridor. In 2009, according to the study, the lot showed a utilization rate of 66 percent. A West Newton lot was shown in the CTPS study; however, it does not appear in current MassDOT data. In 2005, the utilization rate of this lot was 65%.

Table 14: Select I-90 MassDOT Park and Ride Locations

PARK & RIDE LOCATION	# SPACES	UTILIZATION	BUS SERVICE**	ROUTE
AUBURN		No Data		
MILLBURY (EXIT 10A)	301	No Data	NO	-
MILLBURY (EXIT 11)	122	No Data	NO	-
FRAMINGHAM	90	66%	MWRTA; Logan Express	RTE. 7
WESTON	100	No Data	NO	-
WEST NEWTON	165	65%	NO	-

Source: MassDOT Park and Ride Lots, Accessed 5/31/2022

Note: All but one Park and Ride lots have a very limited number of handicapped spots: Auburn (5), Millbury-Exit 10A (8), Millbury-Exit.

Based on historical data, there is not only room to grow utilization of the lots but also opportunity to launch a free Express Bus service pilot to promote and test uptake of such a service that could be used to mitigate congestion during and after the I-90 Allston Multimodal Project. If managed lanes are implemented as per Recommendation 5 in this report, the Express Bus service could utilize these lanes, free of charge, to decrease commuting times, which would further incentivize use.

MassDOT could undertake a new study to update information on Park and Ride lots along the I-90 Corridor, including number of spaces, accessibility, utilization rates, and potential expansion opportunities (if needed). This could provide a foundation from which to develop and implement a Free Express Bus pilot. Funding for this project could come from revenues accrued through the Managed Lane Pilot.

Mid-Range (2025-2030) Recommendations

Recommendation 7: Complete Initial Upgrades to Framingham/Worcester Commuter Rail Line by Q3 2025

The MBTA ranks sixth in the nation for busiest Commuter Rail system, encompassing 388 miles across 14 rail lines, carrying over 125,000 passenger trips each weekday pre-pandemic.[30] The system relies on 100% diesel locomotives to bring commuters into the city core with two main terminals—South and North Station—with peak headways between 20 minutes/20-50 minutes and off-peak headways between 40 minutes and 1-2/hours.[31]

The Framingham/Worcester Line serves communities along the Massachusetts Turnpike (I-90) and is an integral part of the transportation corridor that connects the western suburbs to the inner core. Pre-pandemic the Framingham/Worcester Line was the system's second busiest line (after Providence-Stoughton) and had 9,353 daily week-day inbound boardings, 7,664 during the morning peak hours with 98% of all riders boarding before Boston Landing and commuting to jobs at Lansdowne, Back Bay or South Station.[32] [33]

There are "no regrets" initial infrastructure improvements, including track realignment and upgrades to signals, stations (platforms, other), bridges and highway grade crossings, and new interlockings.[34] Some projects are in the planning and design phase, while others are in the construction stage. Upgrades to the Framingham/Worcester Line would support much needed modernization to the line to meet current and future rider demand needs. It would enable Regional Rail service that offers convenient, frequent, reliable bi-directional 15-minute urban "inner core" rail service, 35 minute local and 21 minute express trains to/from Framingham, and 57 minute local and 45 minute express trains to/from Worcester.[35]

Table 15: Examples of No-Regrets Infrastructure Improvements

INFRASTRUCTURE IMPROVEMENT	STAGE	START DATE	COMPLETION DATE	COST $
FRAMINGHAM/WORCESTER TRIPLE TRACK	Design	2021	2030	$399M-406M
FRAMINGHAM/WORCESTER LINE ELECTRIFICATION	Planning/Rail Transformation	Tentative 2031	Tentative 2040	$249M
NEWTON STATIONS ACCESSIBILITY IMPROVEMENTS (AUBURNDALE WEST NEWTON NEWTONVILLE)	Design (30%)	2019	2024 to 2027	$129M
WEST STATION*	Planning/Rail Transformation	N/A	N/A	N/A
WORCESTER UNION STATION IMPROVEMENTS	Construction	2021	Winter 2023	$45M
NATICK STATION ACCESSIBILITY IMPROVEMENTS	Construction	2019	2024	$36.2M
ATC/PTC SIGNALS	Complete	2020	2020	N/A
BRIDGES & HIGHWAYS (BACON STREET AND INTERVALE ROAD BRIDGES)	Construction	2019	Summer 2022	$30M

Sources: Worcester Triple Track Design Professional Services Contract (mbta.com); http://transitmatters.org/regional-rail-phase-1; Newton Commuter Rail Stations Accessibility Improvements October 13 Virtual Public Meeting Presentation (mbta.com); Newton Commuter Rail Stations Improvements (mbta.com); Worcester Union Station Improvements | Projects | MBTA; Natick Center Station Accessibility Improvements | Projects | MBTA; https://www.mbta.com/projects/rail-bridge-replacements#bacon; https://www.mbta.com/projects/rail-bridge-replacements#intervale; https://www.mbta.com/projects/commuter-rail-positive-train-control-ptc

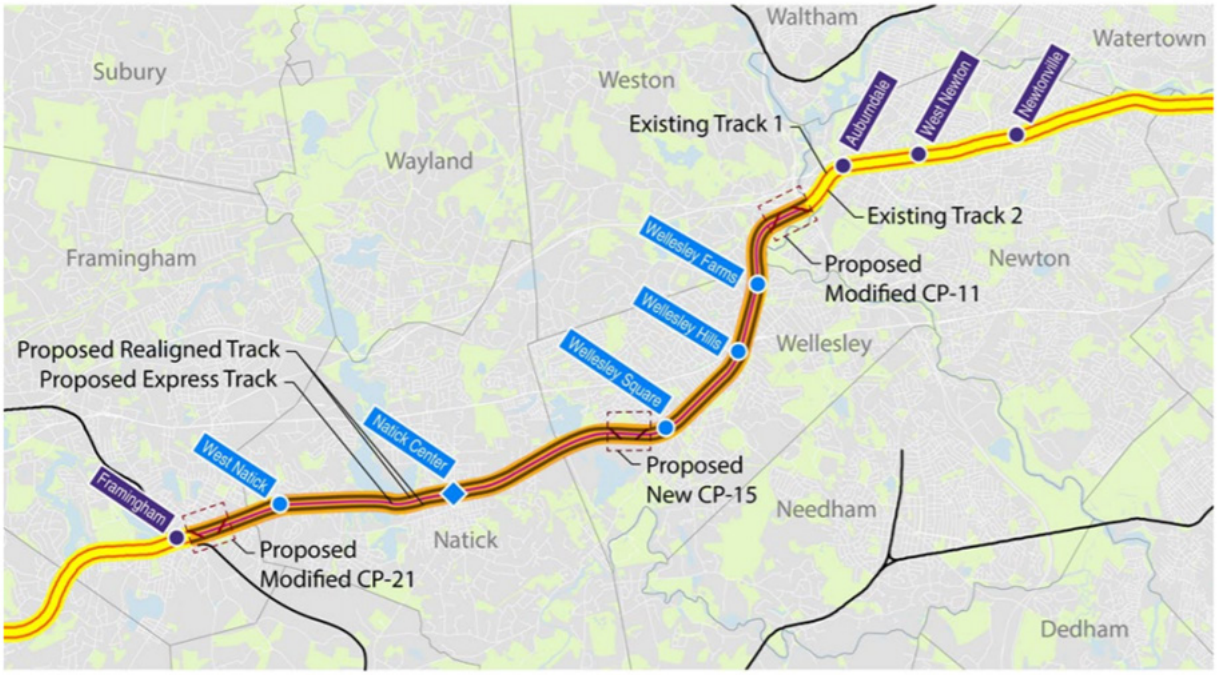
Note: TransitMatters estimates a timeline for completion of Triple Track and West Station by 2025 if construction begins in 2024, page 12

Recommendation 8: Install Triple Track Along Framingham/Worcester Line between Framingham and Route 128

Improving service on the Framingham/Worcester Line, including operational capacity, accessibility, reliability, could be an important component to mitigate traffic and economic disruption resulting from the I-90 Allston Multimodal Project expected to start in the third quarter of 2025. At present, the entire Framingham/Worcester Line is double tracked, which limits the number of express service trains, a popular offering for commuters.

Adding a three-track section between Route 128 and Framingham would improve rail line capacity, reduce commuting times, enable faster express service, and allow express trains with limited stops to bypass local commuter rail traffic. It would also allow the MBTA to offer "Heart to Hub Worcester Express" service during AM and PM peaks (currently only AM), provide additional zone express and local peak period trips, etc.[36] This might incentivize mode shift and increase use of the Framingham/Worcester Line during (and hopefully after) the I-90 Allston Multimodal Project construction period.

Figure 5: Triple Track Plan for Framingham/Worcester Line



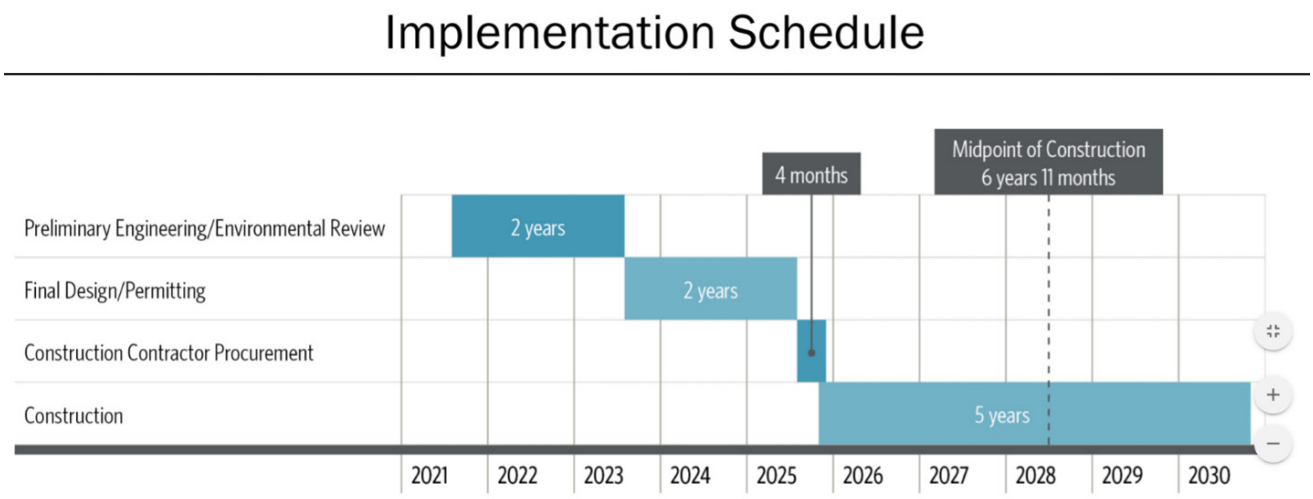
Source: https://cdn.mbta.com/sites/default/files/2021-06/2021-06-21-fmcb-17-worcester-triple-track-contract-accessible.pdf

Note: This table provides an overview of BIL grant submissions that support Regional Rail or upgrades to the Framingham/Worcester Line only. It is not representative of the full list of grant submissions by the MBTA or MassDOT.

The third track would be installed as a "center track" at the five affected stations, which would allow for express service that does not disturb the outer "local" tracks at these stations.[37] The infrastructure upgrades would increase speeds allowing for increased train frequencies. In other words, a third track between Framingham and Newton would clear up train congestion and allow express train to pass specific stations without needing to wait for the right of way. This would improve the capacity for increased frequency of both local and express trains, improving capacity prior to electrification.

To achieve the full benefits of the third track and increase service, additional trainsets and associated support facilities for maintenance and layout may be needed.[38] [39] If Regional Rail, Phase I, is accelerated, with electrification completed on the Providence-Stoughton, Fairmount, and Newburyport-Rockport Lines, the coaches and diesel locomotive stock from those lines could be transferred to the Framingham/Worcester Line to boost frequency.[40]

Figure 6: Worcester Line Track and Station Accessibility Improvements Schedule



Source: MBTA Contract No. C72PS01 Worcester Line Track and Stations Accessibility Improvements (P0261) Design and Engineering Services, June, 2021

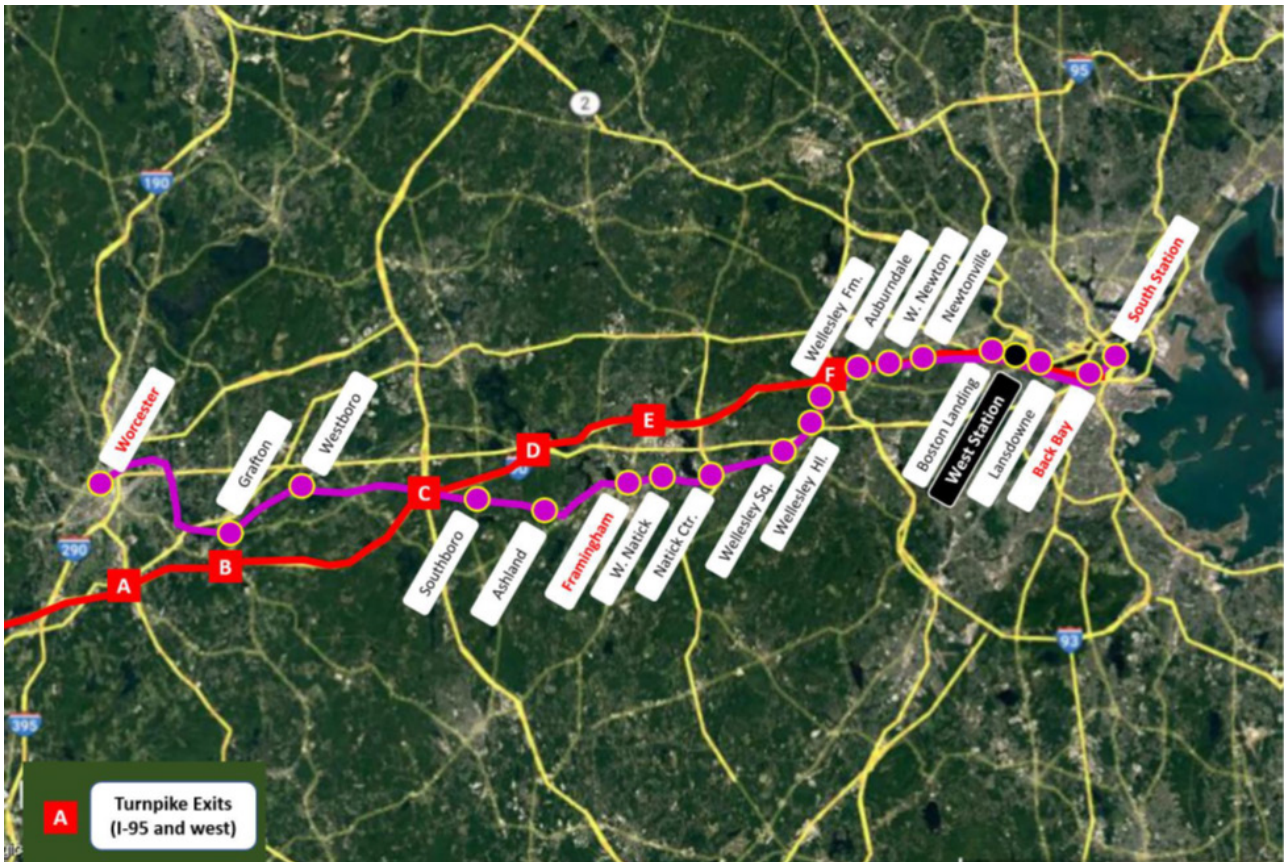
The MBTA approved Contract No. C72PS01, "Worcester Line Track and Stations Accessibility Improvements (P0261) Design and Engineering Services" in June 2021, is advancing planning for an express-only third track between Framingham and Route 128.[41] This express track would extend from just east of Framingham Station (specifically Control Point (CP) 21, between Concord Street and Bishop Street) to a point between Wellesley Farms and Auburndale (CP11, just west of Route 128), which is an interval approximately 11 miles long.[42]

Implementation of the construction phase of this project is scheduled to begin simultaneously with the I-90 Allston Multimodal Project in Q3 2025. The entire project schedule should be accelerated to ensure completion of the infrastructure upgrades before the I-90 Allston project is completed to contribute to mitigation during the construction period; if it is expeditious to do so, the project could be done in phases to allow for a partial third track to come online during the I-90 project.

Recommendation 9: Open West Station as Early as Possible During the Construction Period

The Framingham/Worcester Line serves commuters coming into Boston from Central Massachusetts and MetroWest. Despite passing in close proximity to both, the line does not currently have a rail station that serves Allston or Cambridge. Boston Landing, in Brighton, is the closet option a 20 minute to walk to Allston and longer to Cambridge rendering these areas inaccessible to commuter rail service.[43] This leaves a significant gap in public transit service for employers and employees and makes commuters dependent on personal vehicles as their primary transportation mode.

Figure 7: West Station – A Multimodal Transit Hub



Source: A Better City and AECOM (2022), Economic Benefits of the Allston Multimodal Project

The construction of a multimodal hub along the Framingham/Worcester Line, "West Station", would connect Commuter Rail riders to Allston, the Boston University and Harvard campuses, and, with future connections via the Grand Junction Line, Kendall Square in Cambridge. The current design supports four tracks and three platforms, which combined with the third track between Framingham and Newton would allow more express service between Framingham and South Station. Eventually, riders could connect at West Station to service to Kendall Square via the Grand Junction Line, allowing rail commuters a more direct trip to Cambridge than via a Red Line transfer at South Station.[44] In addition, the hub would offer access to additional active and passive transportation options, including bus, shuttles, bicycle, and pedestrian use. It would also be a convenient way to link commuters to jobs and destinations in Allston and Boston, and with electrification of the line, the MBTA could run at least 15-minute headways from Auburndale or Riverside to Boston.

Like the triple track and electrification, construction of West Station would need to be completed as part of a separate contract from the Multimodal Project and would require significant as part

of a separate contract from the Multimodal Project and would require significant track, signal, and switching changes that would need to be compatible with future work in the Multimodal Project. Alternatively, the construction sequence for the Multimodal Project could be adjusted to provide an opportunity to complete West Station and related bus connections for the multi-modal hub to provide service as early as possible in the implementation of the project. The overall construction staging plan for the project is currently still under development. Construction of West Station would strengthen the argument for partial or full electrification of the Framingham/Worcester Line.

Long-term (2030-2040+) Recommendations

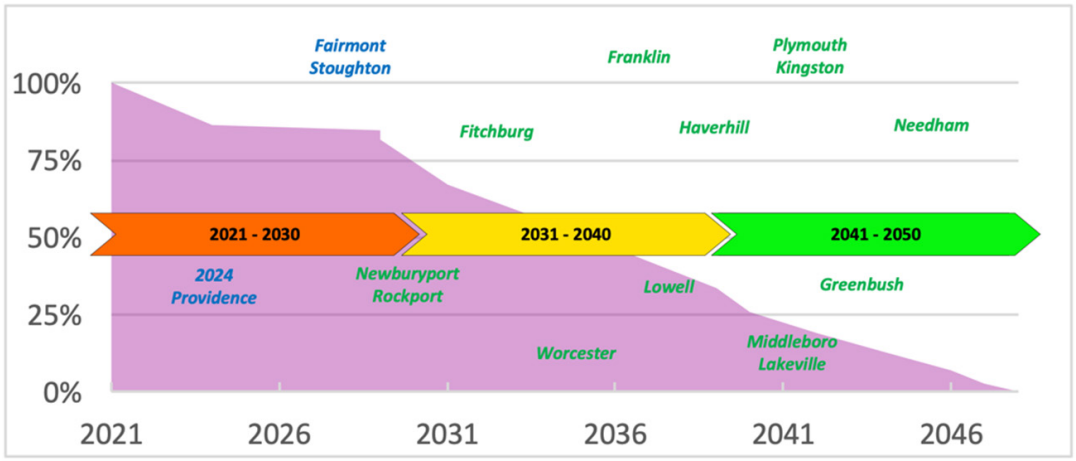
Recommendation I0: Electrify Framingham/Worcester Line (Partial or Complete)

Full or partial electrification of the Framingham/Worcester Line would result in reduced particulate matter, improved air quality, as well as significant travel time savings, reliability benefits, productivity increases, and accessibility improvements. It would allow for convenient, frequent, and reliable Regional Rail service that offers bi-directional 15-minute urban "inner core" rail service, 35-minute local and 21-minute express trains to/from Framingham, and 57 minute local and 45-minute express trains to/from Worcester. [45]

These types of improvements will be key factors to promoting short- and permanent mode shift and retaining riders, which could be important during the construction of the I-90 Allston Multimodal Project to minimize congestion and related negative impacts. Electrification also supports implementation of the MBTA's Rail Transformation Initiative, voted on in November 2019, that seeks to modernize the region's commuter rail and transform service to a regional rail model.[46]

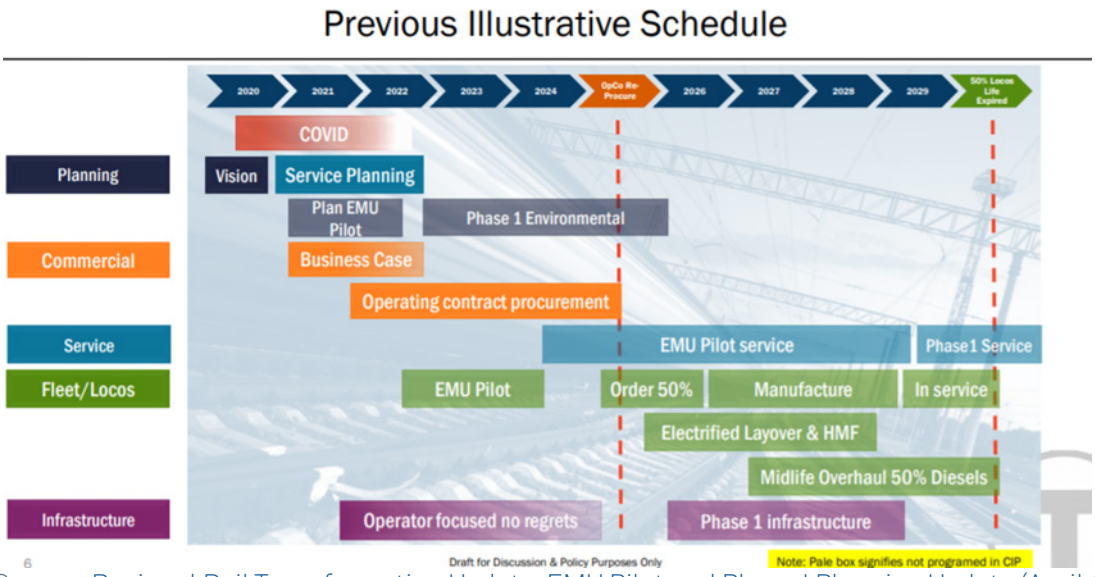
In April 2021, the MBTA presented a tentative timetable for a phased, deadline-driven Regional Rail Transformation approach (Figure 8) that seeks to fully electrify the MBTA Commuter Rail system.[47] Electrification of the Framingham/Worcester Line was slated for Phase 2 (2031-2040), prioritizing electrified service on the Environment Justice Corridor lines (Fairmount and Newburyport/Rockport) as well as testing the use of Electric Multiple Units (EMUs) on the Providence/Stoughton Line, referred to as Phase I (2021-2030) (Figure 9).

Figure 8: MBTA Rail Transformation Timeline



Source: Regional Rail Transformation Update: EMU Pilot and Phase I Planning Update (April 12, 2021)
Note: Blue – Overhead Catenary; Green – Battery (with Overhead Contact System [OCS])

Figure 9: Illustrative Schedule: Phase I Regional Railmode.



Source: Regional Rail Transformation Update: EMU Pilot and Phase I Planning Update (April 12, 2021)

The implementation of Regional Rail Transformation is significantly delayed. Some "early action" items are complete with the status of others unknown (Table 16). The FY23-27 MBTA Capital Investment Plan (CIP) allocates $65.1 million ($55.6 for planning and $9.5 for construction) —a fraction of the $2.6 billion in capital costs needed to implement Phase I: Regional Rail, leaving the timeline for rail transformation up in the air.[48]

Table 16: Actual Status of Phase I Regional Rail Implementation

	TASK	STATUS
SERVICE CHANGES		Partial New "regional rail" schedule effective April 5, 2021.[49]
TRANSFORMATION PLANNING	Detailed Technology & Electrification Study	Status Unknown Estimated delivery 2021 Q3
	Fleet & Facilities Needs	Status Unknown Underway
	Boston-Provide EMU Pilot Feasibility Study	Status Unknown Presentation 5/24/21[50] Estimated delivery end 2021 Q2
PROCUREMENT	Acquire or lease existing Buy America compliant rolling stock for Provide EMU Pilot -Studying potential modifications required to infrastructure or rolling stock -Investigating major procurements that have unneeded options which may be transferable	Status Unknown Status of studies and investigation unknown
PHASE I ELECTRIFICATION		
BOSTON TO PROVIDENCE LINE	Providence Line already electrified to Providence -Missing 1.7-mile gap at Attleboro station is being filled -Potential need for additional feed and transformer station is being modelled -Investigating staged introduction of EMUs and impact of new Acela fleet -Low bridges are being surveyed for potential conflict with the range of EMUs under consideration -Coordination with Amtrak and Utilities	Status Unknown for action items
ALL LINES	Conceptual design work (varies by line)	Status Unknown Providence: 2021 Q3-2022 Q1; Fairmount: 2021 Q4-2022 Q2 Boston to Beverly: 2021 Q3 – 2022 Q2

Source: Authors based on Regional Rail Transformation Update: EMU Pilot and Phase I Planning Update (April 12, 2021)

Electrification of the Framingham/Worcester Line is currently not part of Phase I; however, if it is possible to integrate into Phase I, it could offer riders better service and induce mode shift during the I-90 Allston Multimodal Project. Partial electrification could be an option, which might be more feasible.

Estimates show that 60.9% of Commuter Rail riders originate from Zones 3-7 (Table 17). For the Framingham/Worcester Line that covers stations from Westborough (Zone 7) thru Wellesley Farms (Zone 3). Electrification starting in Zone 2 (Auburndale) thru Zone 1A, for example, would provide 15-minute travel times to the city. This could be considered in combination with other mitigation strategies (Managed Lanes, Express Buses, Fare Incentives, Parking, etc.).

Table 17: Estimated Zone Distribution - MBTA Commuter Rail Ridership

	% OF TOTAL RIDES	% OF RAIL RIDES
ZONE 1A:	2.2%	2.4%
ZONES 1-2:	19.6%	21.4%
ZONES 3-7:	60.9%	66.7%
ZONES 8-10	8.7%	9.5%
TOTAL:	91.3%	100%

Source: Rubén Grayson Morgan-Roselló (2021) A Fare Approach to Attracting Transit Ridership After COVID-19
Note: Accurately weighted estimate

Electrification of the Framingham/Worcester Line would require putting in a place a new power source and replacing the existing diesel trains with Electric Multiple Units (EMUs). There are two methods for electrifying existing railways: overhead and ground-level power (Table 18). Overhead power would require Installing catenary overhead wiring would enable trains to use the existing tracks and maintain contact with the wires to maintain power. Depending on the power source, several options exist for EMUs.

Table 18: Overview of Power Source Options - Electrification Framingham/Worcester Line

OVERHEAD POWER	GROUND-LEVEL POWER
Transitioning to an overhead power source for the full 44.3 mile Framingham/[51]Worcester Line would likely require around 1600 masts and support poles, along with overhead contact running the full length of the line and various power supply lines and cables.	Ground-level power would require installation of a third rail to provide electricity to the vehicle. The contact of the wheels with the tracks would serve to close the circuit for both methods and would not require additional construction. In addition, all stops and stations could be electrified as well to maximize sustainability.[52]

Source: What is Catenary?, July 13, 2017, I SEPTA Philly Blog, accessed 6/17/2022

Full electrification of the Framingham/Worcester Line would require Bi-level or double deck cars given the length of the route. There are pros and cons to both (Table 19). Although single level, multi door models would be more efficient for other parts of the MBTA Commuter rail, bi-level EMUs are suitable to the Framingham/Worcester Line given the number of riders who board before Framingham. Attempting to combine single level and bi-level cars would be inefficient and ill advised.[53] Hybrid EMUs would be best suited for partial electrification of the line.

Table 19: Options for Electric Hybrid Units for Framingham/Worcester Line

TYPE	PROS	CONS
HYBRID EMUS	63 Hybrid EMUs allow for partial electrification of a line. These trains can operate on non-electrified portions either by diesel power or battery power, and switch o electric on the electrified portion of the track. This means a line could be electrified at strategic parts as opposed to full electrification.	No Data Hybrid EMUs are more expensive, close to double the cost compared to non-hybrid EMUs, and DMUs. Hybrid EMUs whether EMU plus Diesel or EMU plus battery requires refueling and recharging each day. This further adds to costs and requires logistical considerations.
BI-LEVEL ("DOUBLE DECK") CARS	Bi-level cars have increased capacity compared to single level, allowing for more passengers. The long distance between stations on the Framingham/ Worcester Line compared to other lines would mitigate ascending and descending times in the car.	Bi-level cars require passengers to ascend and descend stairs to access the cars. This increases boarding times. This also segregates passengers with mobility issues to the accessible foyers on each end.
SINGLE-LEVEL, MULTI-DOOR CARS	These allow for fast, level boarding at multiple entrances, like the subway cars used for MBTA's rapid transit lines. This allows for rapid boarding and deboarding decreasing wait times at stations. Single-level cars also allow access to cars by individuals with mobility issues.	Single-level cars have less per-vehicle seated capacity than the double-level cars. Depending on ridership numbers single-level cars are vulnerable to crowding.

Source: MBTA Presentation to FMCB, Electric Multiple Units RFI Update, June 15, 2020

The infrastructure upgrades and the procurement of EMUs have high upfront costs, the long-term benefits of these upgrades outweigh the initial costs. There are federal resources available as part of the Bipartisan Infrastructure Law (BIL), Federal-State Partnership for Intercity Passenger Rail, targeting projects like Rail Transformation, "A project to improve intercity passenger rail service performance, including reduced trip times, increased train frequencies, higher operating speeds, improved reliability, expanded capacity, reduced congestion, electrification, and other improvements, as determined by the Secretary." that the MBTA and MassDOT could access to help advance electrification of all four lines.[54] There have been significant implementation delays since April 2021, and the MBTA is considerably behind schedule. These setbacks will make it difficult for the MBTA to meet Phase I deadlines and to fully decarbonize the Commuter Rail system by 2050.[55]

Conclusion

Construction of the Allston I-90 Multimodal Project was tentatively set to begin in Q3 2025. This timeline may be delayed due to funding constraints. Pre-pandemic, Boston ranked number for congestion two years running by INRIX,[56] with commuters losing 149 hours due to congestion—equivalent to six days.[57] The segment of the Massachusetts Turnpike that will be affected by the construction project served 147,000 vehicles each day. [58]

There will be a need for some level of mitigation to reduce traffic disruption and the resulting economic costs congestion incurs will therefore be important for the success of the I-90 Multimodal Project. More information is needed on the construction staging and sequencing of the project to determine the most effective mitigations measures to address potential disruptions, including a deeper analysis on the associated transportation impacts.

The following ten recommendation offer a starting point and provide a menu of mitigation measures to address potential transportation impacts associated with the I-90 Allston Multimodal Project. They are divided into three categories: 1) near term (before 2025); mid-range (2025-2030); and long-term (2030 to 2040+).

Near-Term (before 2025)

1) Leverage and blend all available resources, when possible, to fund mitigation recommendations.

2) Develop and implement a robust, multilingual, multimedia Public Engagement and Communications Strategy.

3) Offer Fare Incentives, including free fares on the Framingham/Worcester Commuter Rail Line stations and parking lots, free Express Bus Service from MassDOT Park and Ride lots.

4) Expand parking, where possible, at lots along the Framingham/Worcester Commuter Rail Line and Remove Employer Parking Subsidies.

5) Develop and implement a Managed Lane Pilot that would test viability on I-90 sub-segment 8 (I-495-Hopkinton – MA30-Auburndale) and accrue dedicated revenues to provide free Express Bus and Commuter Rail service for the duration of the I-90 project and pay for any associated infrastructure updates to implement. [59]

6) Provide free "Express Bus" service from MassDOT Park and Ride Lots along I-90 (from Auburn to Weston).

Mid-Range (2025-2030)

7) Complete initial Upgrades to Framingham/Worcester Commuter Rail Line such as adding high level platforms by Q3 2025.

8) Install Triple Track along Framingham/Worcester Commuter Rail Line which may be available to contribute to mitigation for the Multimodal Project later during the construction period, if possible, to expand express service and reduce travel times.

9) Place West Station into service as early as possible during the construction period.

Long-term (2030 to 2040+)

10) Electrify the Framingham/Worcester Commuter Rail (partial and full line) as soon as possible, to provide faster, more reliable bi-directional regional rail service with 15-minute headways and 60-minute headways between Worcester and Boston.

Endnotes

1 MassDOT and City of Boston I-90 Multimodal Project: FY2022 Multimodal Project Discretionary Grant Application, submitted on May 23, 2022.

2 https://www.wgbh.org/news/local-news/2023/01/23/massachusetts-loses-out-on-federal-grant-for-turnpike-redevelopment

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7 AECOM (2022), Economic Benefits of the Allston Multimodal Project

8 https://www.mass.gov/lists/2018-commuter-rail-counts

9 2018 and 2019 INRIX Global Traffic Scorecard. Note: The 2021 INRIX report ranked Boston 18 globally in 2020 for congestion, showing a -47% change from pre-COVID, with an increase in last mile speed from 12 mph to 15 mph. Traffic in Boston is now back to pre-COVID levels and it will be interesting to see how Boston ranks in the 2022 INRIX report.

10 www.abettercity.org

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12 Managed Lanes

13 Personal communication, MIT Mobility Lab

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16 IBID

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40 TransitMatters estimates the need for approximately six additional trainsets to increase service on Framingham/Worcester Line after Triple Track is installed https://transitmatters.org/regional-rail-phase-1
41 In June 2021, the MBTA approved Contract No. C72PS01, "Worcester Line Track and Stations Accessibility Improvements (P0261) Design and Engineering Services, which will "provide Professional Service Contract Phases I-V (0%-100% Design, Bid Phase Services)...An amendment to the contract for Phase VI CPS will be necessary once construction funding becomes available. This contract will be for full execution, but work with be authorized by phases."
42 In June 2021, the MBTA approved Contract No. C72PS01, "Worcester Line Track and Stations Accessibility Improvements (P0261) Design and Engineering Services, which will "provide Professional Service Contract Phases I-V (0%-100% Design, Bid Phase Services)...An amendment to the contract for Phase VI CPS will be necessary once construction funding becomes available. This contract will be for full execution, but work with be authorized by phases."
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